CLAIMS

1. A method of making a solid procatalyst composition for use in a Ziegler-Natta olefin polymerization catalyst composition, said method comprising:

(a) contacting a solid precursor composition comprising a magnesium compound with a halogenating agent and an internal electron donor in any order, in a suitable reaction medium under metathesis reaction conditions, and separating the solid reaction product;

(b) optionally contacting the solid reaction product from step (a) with a halogenating agent in a suitable reaction medium one or more additional times under metathesis reaction conditions and separating the solid reaction product;

(c) contacting the solid reaction product of step (a) or optional step (b) with a halogenating agent and a liquid diluent comprising an aliphatic ether, aliphatic polyether or aliphatic (poly)glycol ether one or more times under metathesis reaction conditions in a suitable reaction medium; and

(d) recovering the solid procatalyst composition.

2. The method of claim 1 wherein the internal electron donor is a C_{1-4} alkyl ester of an aromatic monocarboxylic- or dicarboxylic acid, or a C_{1-4} alkyl ether derivative thereof.

3. The method of claim 2 wherein the internal electron donor is ethylbenzoate, ethyl p-ethoxybenzoate, di(n-butyl)phthalate, or di(isobutyl)phthalate.

4. The method of claim 1 wherein step (c) is conducted at a temperature from 20 °C to 120 °C for a time from 10 minutes to 3 hours.

5. The method of claim 1 wherein step (c) is conducted at a temperature within the range of from 70 °C to 115 °C for a time from 30 to 90 minutes.

6. The method of claim 1 wherein in step (c) the halogenating agent comprises titanium tetrachloride and the liquid diluent comprises a mixture of monochlorobenzene and a (poly)alkylene glycol mono(C_{1-4}) alkylether or a (poly)alkylene glycol di(C_{1-4})alkylether.

7. The method of claim 1 wherein in step (c) the halogenating agent comprises titanium tetrachloride and the liquid diluent comprises a mixture of monochlorobenzene and a (poly)alkylene glycol di(C_{1-4})alkylether.

8. The method of claim 6 wherein the molar ratio of monochlorobenzene: (poly)alkylene glycol monoalkylether is from 3000:1 to 1:1.

9. The method of claim 7 wherein the molar ratio of monochlorobenzene: (poly)alkylene glycol dialkylether is from 3000:1 to 1:1.

10. The method of claim 6 where the (poly)alkylene glycol monoalkylether is tri(propylene glycol) monomethyl ether.

11. The method of claim 7 where the (poly)alkylene glycol dialkylether is di(propylene glycol) dimethyl ether.

12. A solid procatalyst composition for use in a Ziegler-Natta olefin polymerization prepared according to the method of claim 1.

13. A Ziegler-Natta olefin polymerization catalyst composition comprising a solid procatalyst composition according to claim 12, a cocatalyst, and an external selectivity control agent.

14. A process for polymerizing an olefin monomer comprising contacting the olefin monomer under polymerization conditions with a Ziegler-Natta olefin polymerization catalyst composition according to claim 13

15. An olefin polymer prepared by the process recited in claim 14.

16. A method of making a solid procatalyst composition for use in a Ziegler-Natta olefin polymerization catalyst composition, said method comprising:

(a) contacting a solid precursor composition comprising a magnesium compound with a halogenating agent and an internal electron donor in any order, in a suitable reaction medium under metathesis reaction conditions, and separating the solid reaction product;

(b) optionally contacting the solid reaction product from step (a) with a halogenating agent in a suitable reaction medium one or more times under metathesis reaction conditions and separating the solid reaction product;

(c) contacting the solid reaction product of step (a) or optional step (b) with a halogenating agent and a liquid diluent comprising an aliphatic ether, aliphatic polyether or aliphatic (poly)glycol ether one or more times under metathesis reaction conditions in a suitable reaction medium;

(d) separating the solid procatalyst from the reaction medium of step (c);

(e) extracting the solid procatalyst composition by contacting the same one or more times with a liquid diluent at an elevated temperature for a period of time sufficient to prepare a solid procatalyst composition having a decreased titanium content compared to the titanium content of the solid procatalyst composition before said extraction, and

(f) recovering the solid procatalyst composition.

17. The method of claim 16 wherein the diluent in step (e) is selected from the group consisting of toluene, xylene, isopentane, isooctane, chlorobenzene and dichlorobenzene.

18. The method of claim 17 wherein the diluent is chlorobenzene.

19. The method of claim 17 wherein the extraction is conducted at a temperature above 45 °C.

20. The method of claim 17 wherein extraction takes place at a temperature between 120 °C and 150 °C.

21. The method of claim 17 where the extraction is conducted for a period ranging from 5 minutes to 24 h.

22. The method of claim 17 wherein the extraction is repeated at least once.

23. A solid procatalyst composition for use in a Ziegler-Natta olefin polymerization prepared according to the method of claim 16.

24. A Ziegler-Natta olefin polymerization catalyst composition comprising the solid procatalyst composition of claim 23, a cocatalyst, and a selectivity control agent.

25. A process for polymerizing an olefin monomer comprising contacting the olefin monomer under polymerization conditions with a Ziegler-Natta olefin polymerization catalyst composition according to claim 24.

26. An olefin polymer prepared by the process recited in claim 25.